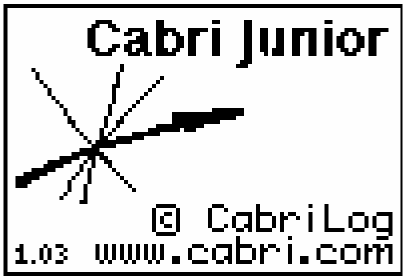
Activity 24 - The Converse of the Pythagorean Theorem

First, turn on your TI-84 Plus and press the APPS key. Arrow down until you see Cabri Jr and press ENTER. You should now see this introduction screen.

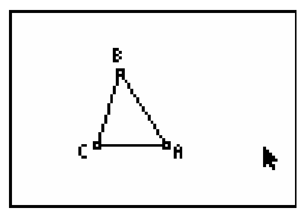


To begin the program, press any key. If a drawing comes up on the screen, press the Y= key (note the F1 above and to the right of the key – this program uses F1, F2, F3, F4, F5 names instead of the regular key names) and arrow down to NEW. It will ask you if you would like to save the changes. Press the 2nd key and then enter to not save the changes.

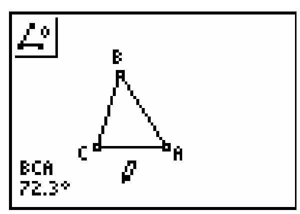
We are now ready to begin.

In the previous activities, we investigated the statement of the Pythagorean Theorem that the sum of the squares of two sides of a right angled triangle will equal the square of the hypotenuse. In this activity, we will look at the converse, that is: If the sum of the squares of the two smaller sides of a triangle are equal to the square of the longest side, then the triangle must be right angled and the angle opposite the longest side is 90^o.

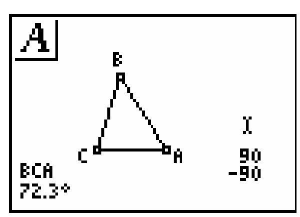
Several of the steps that we need for this activity will be familiar to you. Start with a scalene triangle ABC. Although it does not matter, make side AB the longest side.



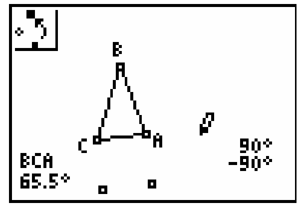
Measure angle BCA and set the measurement off to a corner.



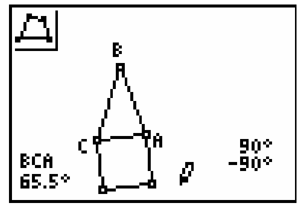
In order to construct a square off the sides we will need the two rotation angles of 90^o and -90^o. Set these values off to the side as well.



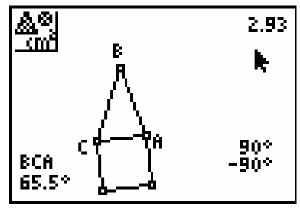
Construct a square off of side AC by rotating point A about point C through an angle of -90 and rotating point C about point A thorough an angle of 90. It may be necessary to shorten the length of AC in order to see the two points. Notice again that the degree symbols have been added to the rotation angles.



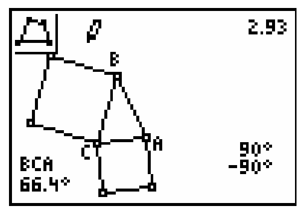
Use the Quad tool to construct the square through points A, C and the two points from the previous step.



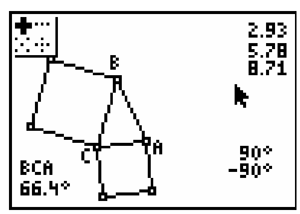
Measure the area of the square that you just created and set this measurement off to an empty corner.



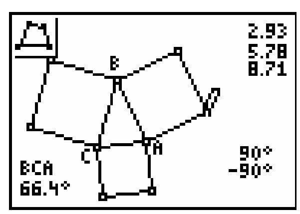
Repeat the process by constructing a square off of side BC. Once again, it may be necessary to shorten the side in order to see the two points.



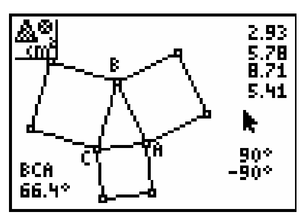
Find the area of the new square and set it off to the side. At the same time, use the Calculate tool to find the sum of the areas of the two squares.



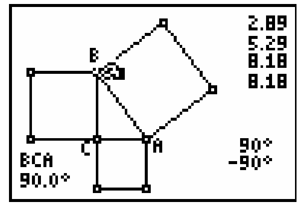
Construct a square off of the longest side, AB.



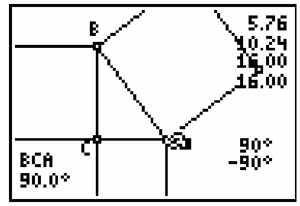
Measure the area of the square constructed off of AB and set this measurement aside underneath the sum of the two other squares.



Drag points A and B until the sum of the areas of the two smaller squares is equal to the area of the larger square. Notice that the angle at point C is exactly 90°.



An interesting development comes about when you drag points so that the squares are no longer fully on the screen. Even though a part of each of the three squares is off of the screen, the result still holds. What would happen if you rotated the triangle? Did you notice that it was easiest to get the result first when the two shorter sides were vertical and horizontal?



Summarize the activity referring to the size of the largest angle? What if this angle is acute? What if this angle is obtuse?